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(54) Powder coating composition

(57) A powdered coating composition comprises a substantially dry powder in association with a biocide, the biocide being capable of retaining effective biocidal activity when the composition is coated on a substrate. The composition may comprise a powder matrix e.g. a polyester or epoxy polyester powder.

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- 1 -
COATING COMPOSITION

This invention relates to a powdered coating composition, for example to a coating composition to be applied to a substrate by spraying.

In one aspect the invention provides a powder coating composition comprising a substantially dry powder in association with a biocide, the biocide being capable of retaining effective biocidal activity when the composition is coated on a substrate.

In one embodiment the invention provides a powder mixture comprising a biocide powder and a powder to form the matrix of the coating composition.

In this embodiment the biocide will conveniently have the same physical characteristics as the matrix powder for ease of application.

Alternatively, the biocide may be incorporated in the matrix powder.

In another aspect the invention provides a coated article, the coating having been formed from a powdered composition, e.g. by spraying, the composition including a biocide, the biocide retaining effective biocidal activity after application to the article.

The coating composition is preferably a paint and the powder to form the matrix of the coating composition, therefore, includes in this embodiment suitable pigmentation.

The coating composition is preferably a dry mixture of the powder constituents.

The biocide may be selected to be active against Gram positive and/or Gram negative bacteria, algae, filamentous fungi or yeasts and may be a general purpose biocide that is active against more than one such category.

Many biocides may be suitably employed in the invention and the average skilled man of the art will readily be able to determine by routine experimentation whether the biocidal activity of any particular biocide will be sufficiently retained for his particular needs in the coating. The necessary criteria are that the biocide can be provided in a suitable powder form and that it can survive the coating process.

Particularly suitable classes of biocides have been found to include:

trichloro hydroxy diphenyl ethers, e.g. 2,4,4¹ - trichloro - 2¹ - hydroxy diphenyl ether,

methyl ureas, e.g. 3 - (3,4 - dichlorophenyl) - LI - dimethyl urea,

imidazolcarbamates.

The matrix of the coating composition may be provided by any suitable material that can be manufactured in powder form, gives the desired properties, e.g. durability, to the applied coating and bonds satisfactorily to the substrate surface.

The article to which the coating is applied is preferably metal, although the invention is not limited thereto and includes, for example, domestic appliances (so-called white and brown goods), work surfaces for domestic and industrial use, architectural and other engineering products, such as hand rails, door handles and plates; garden furniture; and the like. Typical substrates may be, for example, ferrous metals, zinc-coated steels, aluminium and the like. The article may thus be used in any environment where hygiene is advantageous.

The powdered coating compositions of the invention may be applied, for example, by any convenient spraying technique, e.g. manual or automatic electrostatic or tribocharged spraying.

Particularly suitable materials to form the matrix of the coating composition include polyesters and epoxy polyesters and are available in powder form, pre-pigmented and to provide a variety of desired surface finishes - gloss, matt and textured.

Typically the matrix powders may have a specific gravity of from 1.2 to 1.9 and a particle size of which 100% is less than 100 microns and 40 to 60% is greater than 34 microns. They may have stoving temperatures, for example, of from 140° to 210°C

The biocide, when used as a separate powder, is preferably chosen to have a similar particle size distribution to that of the matrix powder.

The amount of biocide incorporated in the powder composition will vary depending on the intended end use and the strength and nature of the particular biocide. Thus suitable amounts can readily be determined from the known mic values of the particular biocide. Typically useful proportions are from 0.1 to 10% by weight of the total powder composition, especially from 2 to 6% by weight.

Other ingredients may be included in the powder composition, for example fluidity agents, dispersants, preservatives.

The powder mixture incorporating the biocide powder has good shelf life depending on the particular biocide used but, alternatively, may be mixed shortly prior to use.

As is well appreciated in the coating art, the substrate must be thoroughly clean before application of the powder mixture and cleaning, e.g. by shot-blasting and/or chemical means may be carried out by conventional means.

Specific embodiments of the invention are further described in the following Examples:

Example 1

Pigmented powdered coating compositions were made by mixing the following powder materials in the proportions shown

		<u>Parts by weight</u>
BIOCIDE PW	-	0 to 6
Matrix powder	-	100 to 94

(BIOCIDE PW is a 2,4,4¹ - trichloro - 2¹ hydroxy disphenylether)

The powdered mixture was sprayed electrostatically onto one metal surface which had previously been degreased shot-blasted to provide several sample slides coated on one surface only.

Bacterial lawn plates of five different bacteria, as listed in the Table below, in Tryptone Soya Agar were prepared and a sample slide was placed, coated side down, in the centre of each plate. The plates were incubated at 37°C for 24-48 hours and observed for zones of inhibition.

The results are listed in the Table below.

(3 replicates per slide:)

Organism	Percentage of Biocide			
	0	2	4	6
E.Coli	—	+-	+-	+-
P.aeuginosa	—	++	+-	+-
S.tyhinurium	—	—	—	—
S.aureus	+-	+-	++	+-
S.faecalis	—	—	+-	—

+ = indicates inhibition

- = no inhibition

It will be appreciated that the invention is not limited to the specific embodiments described. For example, another suitable technique for applying the coating to a metal substrate is the so-called plastics coating technique in which the substrate is preheated and dipped into a bed of the powder. Such a technique also forms part of this invention.

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CLAIMS

1. A powder coating composition comprising a substantially dry powder in association with a biocide, the biocide being capable of retaining effective biocidal activity when the composition is coated on a substrate.
2. A powder coating composition according to Claim 1, which is a powder mixture comprising a biocide powder and a powder to form the matrix of the coating composition.
3. A powder coating composition according to Claim 2, in which the biocide powder and the matrix powder have substantially the same physical characteristics.
4. A powder coating composition according to Claim 1, which comprises a powder to form the matrix of the coating composition and the biocide is incorporated in the matrix powder.
5. A powder coating composition according to any preceding Claim, in which the coating composition is a paint and includes pigmentation.
6. A powder coating composition according to any preceding Claim, in which the biocide is a trichloro hydroxy diphenyl ether.

7

7. A powder coating composition according to Claim 6, in which the biocide is 2,4,4'-trichloro - 2'-hydroxy diphenyl ether.
8. A powder coating composition according to any one of Claims 1 to 5, in which the biocide is a methyl urea.
9. A powder coating composition according to Claim 8, in which the biocide is 3-(3,4-dichlorophenyl)-1,1-dimethyl urea.
10. A powder coating composition according to any one of Claims 1 to 5, in which the biocide is an imidazolcarbamate.
11. A powder coating composition according to any preceding Claim, which comprises a polyester or epoxy polyester powder.
12. A powder coating composition according to any preceding Claim, which comprises from 0.1 to 10% by weight of biocide.
13. A powder coating composition according to Claim 12, which comprises from 2 to 6% by weight of biocide.
14. A powder coating composition according to any preceding Claim, which comprises a matrix powder of specific gravity from 1.2 to 1.9 and a particle size less than 100 microns.

8

15. A powder coating composition according to Claim 14, in which 40 to 60% of the particle size is greater than 34 microns.
16. A coated article having a coating formed from a composition of any one of the preceding Claims.
17. A coated article according to Claim 16, in which the coating has been applied by spraying.
18. A coated article according to Claim 16 or 17, in which the substrate is metal.
19. A coated article according to Claim 18, in which the coating was applied using a stoving temperature of 140° to 210°C.
20. A powder coating composition substantially as hereinbefore described with reference to the Example.



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Examiner: Miss Maureen M.
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Claims searched: 1 to 20

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.0): C3K KPA, C3V VCA, VCX

Int Cl (Ed.6): C09D 5/00, 5/03, 5/46

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	WO 94/11446 A1 COURTAULDS COATINGS see page 13, line 13, to page 15, line 24	11
X,Y	WO 91/08268 A1 THOMAS SWAN see claims 1 and 5 and page 3, line 13, to page 4, line 8, and Examples 1 and 5	X:1,2,3,4, 5,8,9,12,1 6,17,18,19 20 Y:11
X,Y	US 4629645 A INONE see claims 1 to 4 and 10 to 14, column 3, lines 21 to 28, column 4, lines 17 to 42, column 5, lines 21 to 54, and column 5, line 66, to column 6, line 9, and Example 1	X:1,2,3,4, 5,12,14,16 17,18,19, 20 Y:11
X,Y	US 3817761 A DU PONT see claims 1,2 and 6 to 11, column 5, lines 54 to 70, and column 6, lines 16 to 23	X:1,2,3,4, 5,10,16,17 18,19,20 Y:11

X Document indicating lack of novelty or inventive step
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